What is claimed is:

1. A reflecting key encoding station for a two-way quantum key distribution (QKD) system, comprising:

a phase modulator;

a Faraday mirror arranged to reflect pulses of radiation arriving from a transmitting key encoding station through the phase modulator;

a controller, coupled to the phase modulator, that provides a first gating signal to the phase modulator to activate the phase modulator to modulate one of the pulses of radiation; and

a single-photon detector coupled to the controller and gated with a second gating signal from the controller to detect pulses of light entering and/or leaving the reflecting key encoding station.

2. A reflecting key encoding station according to claim 1, further including a beamsplitter arranged to direct a portion of the pulses of radiation to the single-photon detector.

3. A reflecting key encoding station according to claim 1, further including a photon-emitting device arranged to provide a calibration radiation beam to the single-photon detector.

4. A reflecting key encoding station according to claim 1, including an optical coupler arranged to direct at least a portion of the pulses of light to the single-photon detector.

5. A reflecting key encoding station according to claim 1, including an optical switch arranged to selectively reflect the pulses of light to the single-photon detector.

6. A reflecting key encoding station according to claim 1, further including a photon-emitting device optically coupled to the single-photon detector and

adapted to emit single-photon pulses in order to calibrate the single-photon detector.

7. A method of improving the security of a two-way quantum key distribution (QKD) system, comprising:

providing a reflecting key encoding station having a single-photon detector; and

monitoring radiation pulses incoming to and/or outgoing from the key encoding station using the single-photon detector.

8. A method according to claim 7, further including calibrating the single-photon detector with a photon-emitting device located within the reflective key encoding station.

9. A method according to claim 7, including gating the single-photon detector so that the single-photon detector detects light pulses corresponding to a time period during which a phase-modulator in the reflective key encoding station is activated.

10. A method according to claim 9, including sending a gating pulse from a controller to the single-photon detector to gate the detector.

11. A method according to claim 7, including:

randomly activating an optical switch to direct some of the incoming radiation pulses to the single-photon detector; and

gating the single-photon detector to detect the randomly directed incoming radiation pulses.

12. A method according to claim 7, including:

randomly activating an optical switch to direct some of the outgoing radiation pulse to the single photon detector; and

gating the single-photon detector to detect the randomly directed outgoing radiation pulses.

13. A method according to claim 7, including

randomly activating an optical switch to direct some of both the incoming and outgoing radiation pulse to the single-photon detector; and

gating the single-photon detector to detect the randomly directed incoming and outgoing radiation pulses.

14. A method according to claim 7, wherein the two-way QKD system includes a transmitting/receiving key encoding station that transmits radiation pulses to the reflective key encoding station and receives phase-encoded radiation pulses sent from the reflecting key encoding station, the method further including:

counting the average number of photons per radiation pulse in a given time interval entering (μ_{IN}) and leaving (μ_{OUT}) the reflecting key encoding station using the single-photon detector; and

comparing μ_{IN} to μ_{OUT} to detect the presence of radiation pulses entering the reflective key encoding station that were not sent by the transmitting/receiving key encoding station.